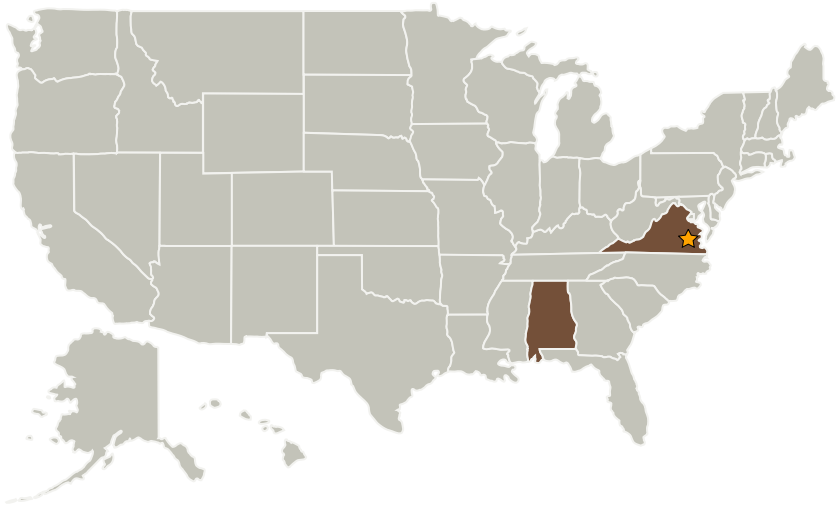
Multi-Physics Computational Modeling Tool for Materials Damage Assessment, Phase I

Completed Technology Project (2007 - 2007)

Project Introduction

The innovation proposed here is to provide a multi-physics modeling tool for materials damage assessment for application to future aircraft design. The software compute engine is based on an existing state-of-art multi-physics solver using first principles of mechanical engineering. Phase I will solve two significant NASA cases using this solver: 1) Coupled fluid-structure simulation of an aircraft wing with aeroelastic behavior and possible fragmentation of the wing, and 2) Simulation of a fuel tank rupture at a ground test facility including trajectory computation of the large fragments. Upon successful demonstration on these two problems, Phase II will proceed to enhance the Multi-Physics, fluid-structure-thermal, compute engine with: 1) a Graphical User Interface (GUI) wrapper to control the simulation, 2) The addition of continuum damage models, 3) a library of models for current NASA materials damage assessment cases, and 4) documentation of the GUI, delivery of the software and on-site training classes. The GUI will allow non-expert users to import existing models from commercial CAD packages and Finite Element codes. Using a desktop Personal Computer, engineers can quickly make accurate and reliable damage assessment decisions for future aircraft structures.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
Digital Fusion	Supporting Organization	Industry	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.5 Modeling and Simulation for EDL